EPA
United States
Environmental Protection
Agency

Office of Prevention, Pesticides,
and Toxic Substances

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**SUBJECT:** **Environmental Fate and Ecological Risk Assessment for the Reregistration of Acrolein (Magnacide B®) – Oil Field Uses**

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**Background:**

Magnacide B® (Acrolein) is used as a microbiocide in oil field water systems to control water-borne planktonic and sessile sulfate-reducing bacteria that accumulate on tubular metal surfaces within the well head, plus other aerobes and anaerobes in oil field water. Organisms controlled are typically the bacteria, *Desulfovibrio sp.* and the iron bacteria *Crenothrix sp.* Fungi, molds, and capsulated bacteria are also controlled. Acrolein can be applied to freshwater or seawater. Using a closed system, acrolein is metered and injected into a water storage tank, heater/treater, separator tank, in the precipitator, at the producing or injecting head, or other convenient sites. Acrolein is injected as a continuous treatment, slug treatment, or batch and squeeze treatment.

Continuous treatment dosages:
5 to 50 ppm (1.5 # Magnacide B® hour/10,000 barrels of water to achieve 10 ppm)
Slug treatment dosage:
100 ppm for 6 hours, or weekly (3.56# Magnacide B® /hour/2,400 barrels water per day)
Batch and Squeeze treatment dosages:
Vessels – use an initial dosage of 100 ppm, maintenance dosage of 50 ppm.
Well Squeezes – 0.5 to 1.2% by volume – shut well down for 24-73 hours.
(337# Magnacide B® /10,000 barrels water to achieve 100 ppm)

**Potential Risks To Non-target Organisms:**

Oilfield uses such as treatments of drilling muds and waterfloods are considered by AD to pose little adverse risk to non-target organisms or listed species. Antimicrobials are typically minor use chemicals, diluted and greatly reduced before discharge into water, and are often regulated by other Federal or EPA offices (OW, Office of Solid Waste, OPPTS, state NPDES permits). In the case of oil fields, the US Department of the Interior, Minerals Management Service (MMS) had jurisdiction over the environmental impacts of synthetic drilling fluids in terrestrial and aquatic areas.

Terrestrial oil fields typically use berms and catch basins to prevent surface runoff of oil drilling muds and wastes from oil drilling areas. Estuarine and marine aquatic organisms may be temporarily exposed during marine drilling, however, impacts are limited to a defined area around the oil well (Neff, 2000). The World Health Organization document Concise International Chemical Assessment Documents (CICAD's), number 43 for Acrolein indicates that terrestrial organisms appear less sensitive than aquatic organisms. Acrolein is highly reactive having a short ½ life in air and water. It is unlikely to partition to soil or sediments and is rapidly metabolized by organisms. Acrolein is not expected to bioaccumulate in aquatic organisms (INCHEM, 2002).

The AD conducts a hazard labeling review for oilfield pesticides and requires the submission of three ecotoxicity tests: one acute oral bird, one acute freshwater fish, and one acute freshwater aquatic invertebrate. If the pesticide is to be used in estuarine or marine environments, three additional acute estuarine/marine toxicity studies are required. Based on ecotoxicy data presented in the EFED acrolein science chapter, acute aquatic freshwater and estuarine/marine organism data requirements are met. All oil field labels must state: "This pesticide is toxic to birds, mammals, fish, aquatic invertebrates, oysters, and shrimp". "This pesticide is expected to be toxic when in contact with terrestrial or aquatic plants".

**Endangered Species Considerations**

Section 7 of the Endangered Species Act, 16 U.S.C. Section 1536(a)(2), requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) for marine and anadromous listed species, or the United States Fish and Wildlife Services (FWS) for listed wildlife and freshwater organisms, if they are proposing an "action" that may affect listed species or their designated habitat. Each federal agency is required under the Act to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. To jeopardize the continued existence of a listed species means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species." 50 C.F.R. ' 402.02.

To facilitate compliance with the requirements of the Endangered Species Act subsection (a)(2) the Environmental Protection Agency, Office of Pesticide Programs has established procedures to evaluate whether a proposed registration action may directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of any listed species (U.S. EPA 2004). After the Agency's screening-level risk assessment is performed, if any of the Agency's Listed Species LOC Criteria are exceeded for either direct or indirect effects, a determination is made to identify if any listed or candidate species may co-occur in the area of the proposed pesticide use. If determined that listed or candidate species may be present in the proposed use areas, further biological assessment is undertaken. The extent to which listed species may be at risk then determines the need for the development of a more comprehensive consultation package as required by the Endangered Species Act.

For certain use categories, the Agency assumes there will be minimal environmental exposure, and only a minimal toxicity data set is required (Overview of the Ecological Risk Assessment Process in the Office of Pesticide Programs U.S. Environmental Protection Agency - Endangered and Threatened Species Effects Determinations, 1/23/04, Appendix A, Section IIB, pg.81). Chemicals in these categories therefore do not undergo a full screening-level risk assessment. The oil field uses of acrolein fall into this category.

If it is determined that there is potential for acrolein oil field uses to overlap with listed species and that a more refined assessment is warranted, to include direct, indirect and habitat effects, the refined assessment should involve clear delineation of the action area associated with acrolein oil field uses and best available information on the temporal and spatial co-location of listed species with respect to the action area. This analysis has not been conducted for this assessment. An endangered species effect determination will not be made at this time.

**Bibliography**

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INCHEM. 2002. "Acrolein – Concise International Chemical Assessment Document 43". World Health Organization. Inter-Organization Programme for the Sound Management of Chemicals (IOMC). R. Gomes and M.E. Meek, Existing Substances Division, Bureau of Chemical hazards, Health Canada, Ottawa, Canada, and M. Eggleton, Environment Canada, Hull, Canada. www.inchem.org/documents/cicads/cicads/cicads43.htm

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